Course Description:

The course will introduce students to the basic economic and engineering used to design competitive and regulated power markets. The main focus will be electricity markets in US: their history, on-going transformation, design and most current issues. Due to its physical nature electricity is a unique commodity and we will examine its characteristics and the way they affect the market structure.

We will also discuss major issues in gas and oil markets; examine latest trends in environmental policy and renewable energy. The course will highlight application of economic theory, such as industrial organization, auction design and economics of taxation in design and implementation of public policies related to energy markets.

Course Structure:

The course will consist of lectures, led by either Margarita Sapozhnikov or Bruce Tsuchida. Bruce will focus on the underlying technical, engineering aspects and real-life examples of current markets while Margarita will focus on economic applications to these markets. We will loosely follow the textbook, however, a lot of material will be lectures only and regular attendance is imperative for this class.

There will be 2 mid-term exams and a final, as well as 5 problem sets. Students may work together on problem sets; keep in mind that exams will be based on problem sets so it is important for each student to attempt problem set independently. We will briefly go over assigned problems in class. Feel free to e-mail us at any point if you have questions.

There will be NO make-up mid-term exams; if you miss one of the midterms, we will substitute grade of one of them for both. If you miss both midterms exams you will fail the class.

There will be student in-class presentations at the end of the course. Presentations should be made by groups of 2 – 6 students. Students are free to form their own groups, please let us
know by February 10th which group you are with. After February 10th we will assign the students in groups.
The presentation should be about 20 minutes long and should be based on or at least linked to material covered in class. To choose an interesting topic, we advise you to look through newspapers/magazines on regular basics – there are a lot of energy and environment issues currently in the news. We will judge the presentations based on (a) whether you show deep understanding of the problem (b) how well the topic is linked to economic problems and ideally to economic theory (c) quality of the presentation itself. To encourage active listening, part of final exam will have questions based on in-class student presentations.

**Final grade will be based:**
Problem Sets – 10%
Midterm Exam – 20% each (1st Midterm February 12th, 2nd Midterm March 26th)
Final Exam – 30%
Presentation – 20%

The course is broken down in 3 blocks: Fundamentals of Energy Markets, Financial Markets, and Current Issues in Energy and Environment, with each block being about 9 lectures. The following schedule is tentative and the order of topics within each block may change.

- Market History and Deregulation
- Basic Physics of Energy
- Supply and Demand of Electricity
- Types of Generation Technology
- Start up and average cost
- Linear Model
- Parallel flows (Three node model)
- Introduction to losses (average vs marginal)
- Market clearing price

**II. Markets (February 17th – March 24th)**
- Location Marginal Price (LMP)
- Existing energy markets and their structure
- Ancillary service markets
- Financial Transmission Rights
- Reserves (Operating Reserves and Capacity Reserves)
- Capacity Markets
- Other Financial Instruments:
  - Block Forwards, Reactive Support, Black Start, PPAs and FPAs

**III Current Issues (March 31st – April 28th)**
- Wind/Renewables
- Carbon Policy, Environmental Economics
- Student Project (2 class sessions)

April 30th – Final review session